

## WHAT IS CLAIMED IS:

1. A communication system comprising:

a plurality of nodes, each for transmitting simultaneously with other nodes a signal unique to that signal's node and representative of at least one non-overlapping sub-channel conveying information derived from a data stream, each at least one information-conveying non-overlapping sub-channel for each node being different from each information-conveying non-overlapping sub-channel for all other nodes; and

a base station for simultaneously receiving the signals transmitted from each node and processing them to generate, for each information-conveying sub-channel, a signal representative of the information conveyed thereby;

wherein at least one of the nodes is for transmitting its signal using multiple sub-channels simultaneously, and

in each node, data streams corresponding to sub-channels used in other nodes are set to zero magnitude.

2. A communication system comprising:

a plurality of nodes, each for transmitting simultaneously with other nodes a signal unique to that signal's node and representative of at least one non-overlapping sub-channel conveying information, each at least one information-conveying non-overlapping sub-channel for each node being different from each information-conveying non-overlapping sub-channel for all other nodes; and

a base station for simultaneously receiving the signals transmitted from each node and processing them to generate, for each information-conveying sub-channel, a signal representative of the information conveyed thereby;

wherein sub-channels corresponding to a particular node are not adjacent and are spread out in frequency to avoid effects of narrow band interference and fading.

3. A communication system comprising:

a plurality of nodes, each for transmitting simultaneously with other nodes a signal unique to that signal's node and representative of at least one non-overlapping sub-channel conveying information, each at least one information-conveying non-overlapping sub-channel for each node being different from each information-conveying non-overlapping sub-channel for all other nodes; and

a base station for simultaneously receiving the signals transmitted from each node and processing them to generate, for each information-conveying sub-channel, a signal representative of the information conveyed thereby;

wherein at least one of the nodes is for transmitting its signal using multiple sub-channels simultaneously, and

the base station is for changing at least one sub-channel corresponding to a particular node over time.

4. A communication system comprising:

a plurality of nodes, each for transmitting simultaneously with other nodes a signal unique to that signal's node and representative of at least one non-overlapping sub-channel conveying information, each at least one information-conveying non-overlapping

sub-channel for each node being different from each information-conveying non-overlapping sub-channel for all other nodes; and

a base station for simultaneously receiving the signals transmitted from each node and processing them to generate, for each information-conveying sub-channel, a signal representative of the information conveyed thereby;

wherein the base station is for optimizing mapping between nodes and sub-channels for at least one of each node's required range and data bandwidth needs.

5. The system of claim 4, wherein the base station is for optimizing mapping between nodes by increasing sub-channel allocation to a given node so that node can transmit with a less complex signal.

6. A communication system comprising:

a plurality of nodes, each for transmitting simultaneously with other nodes a signal unique to that node and representative of at least one non-overlapping sub-channel conveying information, each at least one information-conveying non-overlapping sub-channel for each node being different from each information-conveying non-overlapping sub-channel for all other nodes;

a base station for simultaneously receiving the signals transmitted from each node and processing them to generate, for each information-conveying sub-channel, a signal representative of the information conveyed thereby; and

frequency controlling means for controlling the frequencies of signals transmitted by at least one node.

7. The system of claim 6, wherein the at least one node is for setting a transmit signal frequency of at least one of its at least one sub-channel by observing frequencies of signals coming to it from the base station and locking the transmit signal frequency to that of a signal received from the base station.

8. The system of claim 6, wherein:

the base station comprises means for generating and transmitting a command signal to the at least one node based on the frequency of signals from the node as received by the base station; and

the frequency controlling means is disposed in the at least one node and is responsive to command signals from the base station transmitted to the at least one node.

9. The system of claim 6, wherein the at least one node comprises means for receiving a frequency reference signal from a satellite and controlling the frequency of signals transmitted from the node according thereto.

10. A communication system comprising:

a plurality of nodes, each for transmitting simultaneously with other nodes a signal unique to that node and representative of at least one non-overlapping sub-channel conveying information, each at least one information-conveying non-overlapping sub-channel for each node being different from each information-conveying non-overlapping sub-channel for all other nodes;

a base station for simultaneously receiving the signals transmitted from each node and processing them to generate, for each information-conveying sub-channel, a signal representative of the information conveyed thereby; and

timing control means for controlling timing of signals sent by the at least one node;

wherein at least one of the nodes is for transmitting its signal using multiple sub-channels simultaneously.

11. The system of claim 10, wherein the at least one node is for setting a transmit signal timing of at least one of its at least one sub-channel by observing timings of signals coming to it from the base station and locking the timing of signals transmitted from the at least one node to that of a signal received from the base station.

12. The system of claim 10, wherein:

the base station comprises means for generating and transmitting a command signal to the at least one node based on the timing of signals from the at least one node as received by the base station; and

the timing control means is disposed in the at least one node and is responsive to command signals from the base station transmitted to the at least one node.

13. The system of claim 10, wherein the at least one node comprises means for receiving a timing reference signal from a satellite and controlling the timing of signals transmitted from the node according thereto.

14. A communication system comprising:

a plurality of nodes, each for transmitting simultaneously with other nodes a signal unique to that node and representative of at least one non-overlapping sub-channel conveying information, each at least one information-conveying non-overlapping sub-channel for each node being different from each information-conveying non-overlapping sub-channel for all other nodes;

a base station for simultaneously receiving the signals transmitted from each node and processing them to generate, for each information-conveying sub-channel, a signal representative of the information conveyed thereby; and

power control means for controlling power of signals sent by the at least one node;

wherein at least one of the nodes is for transmitting its signal using multiple sub-channels simultaneously.

15. The system of claim 14, wherein:

the base station comprises means for generating and transmitting a command signal to the at least one node based on the power of signals from the at least one node as received by the base station; and

the power control means is disposed in the at least one node and is responsive to command signals from the base station transmitted to the at least one node.

16. The system of claim 14, wherein the power control means includes means for sensing the power of signals from the base station received at the at least one node and controlling the power of signals transmitted from the at least one node responsive thereto.

17. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes;

wherein the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby; and

sub-channels corresponding to a particular node are not adjacent and are spread out in frequency to avoid effects of narrow band interference and fading.

18. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information derived from data streams, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes;

wherein the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby,

the base station is for using multiple sub-channels simultaneously to transmit to at least one of the nodes, and

in the base station, data streams corresponding to sub-channels not used in any node are set to zero magnitude.

19. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes;

wherein the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby,

the base station is for using multiple sub-channels simultaneously to transmit to at least one of the nodes, and

the base station is for changing at least one sub-channel corresponding to a particular node over time.

20. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes;

wherein the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby; and

the base station is for optimizing mapping between nodes and sub-channels for at least one of each node's required range and data bandwidth needs.



21. The system of claim 20, wherein the base station is for optimizing mapping between nodes by increasing sub-channel allocation to a given node so that node can receive a less complex modulation signal that is more robust to noise and interference.

22. The system of claim 20, wherein the base station is for allocating a larger fraction of its total transmit power to a given sub-channel set.

23. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes; and

frequency controlling means for controlling the frequencies of signals transmitted by the at least one node;

wherein the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby.

24. The system of claim 23, wherein:

the base station comprises means for generating and transmitting a command signal to the at least one node based on the frequency of signals from the at least one node as received by the base station; and

the frequency controlling means is disposed in the at least one node and is responsive to command signals from the base station transmitted to the at least one node.

25. The system of claim 23, wherein the base station comprises means for receiving a frequency reference signal from a satellite and controlling the frequency of signals transmitted from the base station according thereto.

26. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes; and

timing control means for controlling timing of signals sent by at least one of the nodes;

the base station is for using multiple sub-channels simultaneously to transmit to at least one of the nodes, and

the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby.

27. The system of claim 26, wherein:

the base station further comprises means for generating and transmitting a command signal to each node based on the timing of signals from the at least one node as received by the base station; and

the timing control means is disposed in the at least one node and is responsive to command signals from the base station transmitted to the at least one node.

28. The communication system of claim 26, wherein the base station further comprises means for receiving a timing reference signal from a satellite and controlling the timing of signals transmitted from the base station according thereto.

29. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes; and

power control means for controlling power of signals sent by each node;

wherein the base station is for using multiple sub-channels simultaneously to transmit to at least one of the nodes, and

the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby.

30. The system of claim 28, wherein the power control means includes means for sensing the power of signals from the base station received at the at least one node and controlling the power of signals transmitted from the at least one node responsive thereto.

31. The system of claim 28, wherein:

the base station comprises means for generating and transmitting a command signal to the at least one node based on the power of signals from the at least one node as received by the base station; and

the power control means is disposed in the at least one node and is responsive to command signals from the base station transmitted to the at least one node.